

**Scientific
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November 17, 1987

BY DHL

Mr. William J. Tricarico
Secretary
Federal Communications Commission
Room 222
1919 "M" Street, N.W.
Washington, D.C. 20554

RE: MM Docket No. 87-268
RM-5811, ~~ATV Inquiry~~

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MAIL BRANCH

Dear Mr. Tricarico:

Enclosed please find an original plus 11 copies of
Scientific-Atlanta's reply to the Commission's Notice of In-
quiry into advanced television.

Yours truly,

James O. Farmer
James O. Farmer
Division Technical Manager

cc: Larry Bradner
Robert L. Corn, Hogan and Hartson
Allen Ecker
David Eggers
Keith Lucas
Graham Mobley

of copies = 0 + 11

Tricarico

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BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C.

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87-268

RM-5881

In the matter of)
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Advanced Television Systems)
and their impact on the)
Existing Television Broadcast)
Service)
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Review of Technical and)
Operational Requirements:)
Part 73-E, Television Broadcast)
Stations)
)
Reevaluation of the UHF Television)
Channel and Distance Separation)
Requirements of Part 73 of the)
Commission's Rules)

COMMENTS ON THE NOTICE OF INQUIRY

Scientific-Atlanta congratulates the Commission in taking positive steps this early in the development of advanced television systems, to ensure that the public derives maximum benefit from whatever system eventually is decided upon.

Our comments consist first of a summary of our understanding of the key issues. This is followed by answers to some of the specific questions posed by the Commission in the subject Notice of Inquiry.

POSITION SUMMARY

Frequency spectrum is a limited resource and attempts should be made to develop HDTV formats that use spectrum efficiently. Of course the picture quality and signal features will be affected by the spectrum utilized on a given signal and trade offs may be necessary between spectrum utilization and picture quality. Although there are specific parameters that can be measured that relate to picture quality, ultimately the judgment of picture quality involves subjective perception.

Modifications to the protection criteria between channels are possible and should be made as indicated in the subsequent text. These modifications can be accomplished by phasing in new protection criteria over a number of years.

In addition to tradeoffs between spectrum utilization and picture quality, careful consideration must be given to the economy of consumer equipment costs as a function of signal format. If HDTV is to be practical for the consumer, reasonably priced consumer equipment must be available.

For both CATV and broadcast applications, NTSC compatibility can be important for both economic and technical reasons. The definition of compatibility can have a range of interpretations. In the strictest sense compatibility means that a standard NTSC TV set can extract a standard NTSC signal format from the advanced television format. In a broader sense, compatibility could mean the same or multiples of line frequency and frame rate to allow simple and economic transcoding from the advanced television format to NTSC. Efficient use of spectrum is also an issue in considering NTSC compatibility.

ANSWERS TO SPECIFIC QUESTIONS IN THE COMMISSION'S NOTICE OF INQUIRY

1. What criteria, such as video/audio quality performance, transmission bandwidth, NTSC compatibility, etc. should the Commission use to evaluate and compare the various ATV technologies? What are the appropriate trade-offs between the various criteria?

A: We feel that the most important improvement that should be offered to the consumer is the wider aspect ratio of HDTV. Other key improvements include elimination of NTSC artifacts and increased resolution. We should remember that the transmission system may not have to support higher vertical resolution by itself. We have been shown some techniques such as line doubling and de-interlacing in the receiver, which may operate quite independently of the transmission system, yet offer improvements which would be available at the option of the TV manufacturer. We should develop a greater understanding of the improvements which can be obtained thusly, compared with those requiring a new TV system.

Concerning sound, consumers are becoming accustomed to "compact disk" quality sound, and something on this order should be provided. As with NTSC transmission, the picture should

degrade just before the sound does. Multiple sound channels should be provided. As a minimum, two stereo pairs should be possible.

The quality of image seen on an NTSC receiver should be quite high if the system is compatible, as we do not foresee a complete changeout to advanced receivers for many years and perhaps never. Loss of quality in NTSC reception is a very subjective judgement. At this time the Commission should go on record as saying that the preferred system will have little or no effect on the quality of the picture seen on an NTSC set, leaving it to the larger body of participants to decide the criteria to use as various systems are evaluated. A proponent will be at some risk that his system will be judged to have undesirable artifacts in the NTSC environment, when he had felt he was safe. This is a risk all proponents may have to take, since artifacts may not become apparent until a system has been scrutinized for a long while.

2. From a technical perspective, what are the advantages and disadvantages of augmenting the channel capacity of existing television assignments? What is the appropriate bandwidth for the augmentation channel? Must it be contiguous to the main channel?

A: Augmentation of existing channels with additional bandwidth is a requirement of many of the proposed systems of which we are aware. Augmentation would presumably increase the power required at the receiver to deliver an acceptable picture, though this presumption might be modified by the subjective noise susceptibility of a system. As to appropriate bandwidth for an augmentation signal, proponents to date have seemed to talk of either 3 or 6 MHz required for augmentation. The less the better all else being equal, from both a broadcast and cable point of view. We suggest that the Commission consider the possibilities of making available either 3 or 6 MHz and publish the results of this study as a guide to proponents. The result would be along the lines that X% of all broadcasters could have an additional 3 MHz opened to them, while if 6 MHz were required, only Y% of broadcasters would have access to HDTV. This would have the effect of attaching a penalty to systems requiring more bandwidth.

Implicit in this is the assumption that the Commission knows what protection criteria to apply in an unknown system. For now we suggest relaxing the taboos along the lines suggested in paragraphs 75 and 76 of the NOI. A proponent who wishes to, may at a later date challenge the principals on which the

Commission based its study, but this challenge should be based on new information concerning the interference potential of his system.

Concerning the issue of contiguous bandwidth, this is a question which is best answered by the proponents, as we cannot make any blanket statements of the effects of non contiguous allocation. However, we might observe that it is likely to do a broadcaster little good to have his NTSC channel in VHF and his augmentation at UHF due to the different propagation characteristics in the two bands. Testing just now beginning by the ATSC should prove useful. Too, few subscribers may be willing to erect both VHF and UHF antennas. Because of the differences in propagation and antenna characteristics, one might want to consider that investigations be undertaken which might lead to a rule that the augmentation channel should not be more than (for example) 30% higher in frequency than the main channel, or vice versa.

From a tuner standpoint, contiguous bandwidth seems to be the preferable route, as that would allow one tuner to tune all required information. This line of thought leads us to prefer systems which utilize the lower adjacent channel for augmentation. Ideally the augmentation signal should not require a separate carrier, but rather should rely on the carrier in the NTSC channel. This would reduce the potential of the lower adjacent channel to cause a beat with another station operating on that lower adjacent channel.

3. Should the Commission implement ATV service at UHF only or at both VHF and UHF in a comprehensive plan?

A: A rule such as the 30% rule suggested above as an example would probably limit ATV service to UHF as a practical matter. The greater availability of spectrum at UHF, and its propagation characteristics, would also lead us to a UHF conclusion. In paragraph 75 of the NOI, the Commission states that some relaxation of the adjacent channel taboo may be in order. This seems a rather natural thing to do, as such a relaxation presumably would free up spectrum for every UHF station.

We believe that many UHF broadcasters are still having trouble operating profitably, so a solution for the VHF broadcaster excluded from HDTV may be to use an otherwise unprofitable UHF frequency to simulcast HDTV using the UHF channel and one adjacent to it, while using his VHF transmitter normally. This is a situation similar to that which existed in the early days of FM broadcasting, when an FM outlet

simulcast with AM, until gradually the FM outlet became more valuable than the AM outlet. As in the FM case, it should be a limited time solution because it doesn't encourage efficient spectrum utilization.

4. Should the Commission accommodate ATV in non-broadcast spectrum allocations? If so, in what portion of the spectrum and how much?

A: Little usable spectrum is available below 1 GHz. For microwave frequencies, the Commission should take part in and benefit from, the results of the ATSC testing just now beginning. If additional spectrum is allocated, we urge the Commission to simultaneously adopt performance standards for receivers which would not result in sparse signal population as in the UHF band, as a result of taboos. Spectrum is now too valuable to allow us to devote large amounts of it to guard bands.

However, given the demands placed on our limited RF spectrum today, and the presumption that the demand will continue to grow, we should first try to accommodate HDTV within the presently allocated spectrum.

5. What is the impact of sharing non-broadcast spectrum with ATV on the non-broadcast services?

A: The present contention for UHF spectrum, between broadcasters and land mobile interests, leads us to suspect that shared use may not be a good idea.

6. The present taboos were adopted in 1952 and have remained unchanged since that time. What taboos should be eliminated or modified and what impact would this have on existing television service?

A: The Commission has made, in this document, seemingly good arguments for modifying the taboos, and we hope future work and comments by receiver manufacturers will lead to further relaxation of the taboos. A Commission policy of easing the taboos over a number of years will encourage manufacturers to continue improving UHF tuner design while minimizing disruption to the public.

In evaluating taboos, provision should be made to accommodate an HDTV system which may want to utilize modulation which would take advantage of partial or complete carrier suppression. The resulting signal would occupy a channel but produce less interference to an existing broadcaster. This

might, for example, take the form of one channel used for NTSC transmission with transmission of an independent sideband (related to the NTSC picture carrier) in the lower adjacent channel. The ISB signal occupying the lower channel would not have the same interference potential as would a normal NTSC signal on that channel. Protection calculations should take into account this lower interference potential.

Another possibility is that the augmentation channel would employ a partially suppressed carrier at other than 1.25 MHz above the lower band edge. For example, a system employing a carrier 3 MHz above the channel edge and using independent sideband transmission with a partially suppressed carrier, would have much less interference potential than would a normal signal.

7. In reevaluating the effect of taboos generally, what percentage of viewers should be protected?

A: A high percentage of viewers of the NTSC broadcast should be protected, though as outlined above, the protection ratios might be allowed to change over some time period. Also, protection ratios should be calculated using the actual interference potential of the HDTV signal. For protection of the viewers of the HDTV signal, tuner performance standards should be incorporated such that HDTV sets would have good enough tuners to require much less protection than do present tuners.

8. Because of the taboos, only 9 (at most) UHF channels can be assigned to any given city.

a. To what extent could broadcasters take advantage of the "gaps" in the allocation to transmit auxiliary information for advanced TV systems?

A: As stated above, gaps on the UHF allocation may well be a good place to transmit augmentation information. The degree to which this is possible depends on the degree to which the chosen system does not interfere with unrelated NTSC transmissions. Interference potential may well be one valid criteria for selecting a proponent system. The opposite problem, the degree to which unrelated NTSC transmissions interfere with HDTV, could be dealt with to a large extent by better UHF tuner design in HDTV receivers.

b. Should new assignments made possible by elimination or modification of taboos be reserved for advanced TV system use, opened for licensing to new full-service stations, or used for other purposes?

A: Based on the number of struggling UHF stations today and the continuing rise in penetration of cable, we feel that at this time only HDTV should be considered for utilization of new assignments.

9. How might future improvements in television receivers affect susceptibility to taboo frequencies?

A: As we have already observed, improved UHF tuners would surely reduce the need for UHF taboos. Previously TV manufacturers have not had incentive to improve UHF tuners' susceptibility to taboos because they were assured of protection by the regulations. However, if the regulations went away or were reduced over several years, the public would have time to receive better tuners.

10. Are advanced TV signals (including any auxiliary signals or augmentation channels) likely to be more or less susceptible to current taboo frequencies? Will new taboo frequencies arise?

A: We have made the assumption that new TV sets, required to receive augmentation, may be made more immune to the taboos by design. While some taboos may remain, a goal of the Commission should be to set standards that would promote more efficient spectrum utilization through improved UHF tuners, within constraints of economy given the present state of the art.

11. Are changes in receiver designs likely to cost effectively reduce the susceptibility of receivers to taboo frequencies for NTSC signals?

A: We have information to the effect that some TV tuner manufacturers may be considering use of double conversion tuners in an effort to improve performance while tuning all CATV frequencies. This type of tuner is well known in CATV already, and can be shown to offer immunity to image and local oscillator problems.

12. What are the anticipated costs of taboo-immune TV receivers and the time frame for significant market penetration?

A: Admittedly the tuners described above would be slightly more expensive than are present tuners, but volume and technology advancements are certain to reduce the price. Tuners in CATV set-top converters selling for under \$35.00 in

volume, offer reasonably good performance. The cost of sales of the tuner portion must of necessity be a fraction of the sales price of the entire unit. As to time frame, the technology described exists now, but tuner manufacturers must be consulted for timetables.

13. Should the Commission take action now to encourage reduced generation of and susceptibility to taboos, either on channels used for NTSC or auxiliary advanced TV signals? If so, what action is appropriate, e.g., spectrum allocation, interference criteria, or other?

A: The Commission can take action in the form of a stated policy that certain taboos will be relaxed within the next 7-10 years. A set of tuner specifications which will be used in calculating relaxed protection ratios could be developed with inputs from industry.